

# 1971

OPERATING  
SUMMARY

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## KINGSTON TWP.

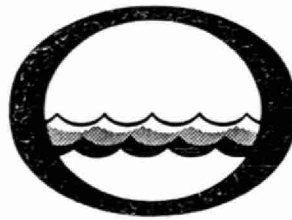
## WATER POLLUTION CONTROL PLANT

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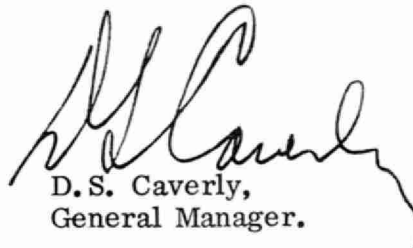



*Water management in Ontario*

Ontario  
Water Resources  
Commission

We are pleased to submit for your consideration a summary of operation during 1971 of the water pollution control plant serving your community.

This operating summary contains parameters normally used to measure plant performance and loading, as well as relevant cost data. Because of the concern over eutrophication of our lakes and of the requirement, in many parts of Ontario, to remove the major contributing factor, results of analysis for phosphorus appear in this summary.

  
D.S. Caverly,  
General Manager.

  
D.A. McTavish, P. Eng.,  
Director,  
Division of Plant Operations.

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135 St. Clair Avenue West  
Toronto 195

KINGSTON TWP.  
WATER POLLUTION CONTROL PLANT

operated for

THE TOWNSHIP OF KINGSTON

by the

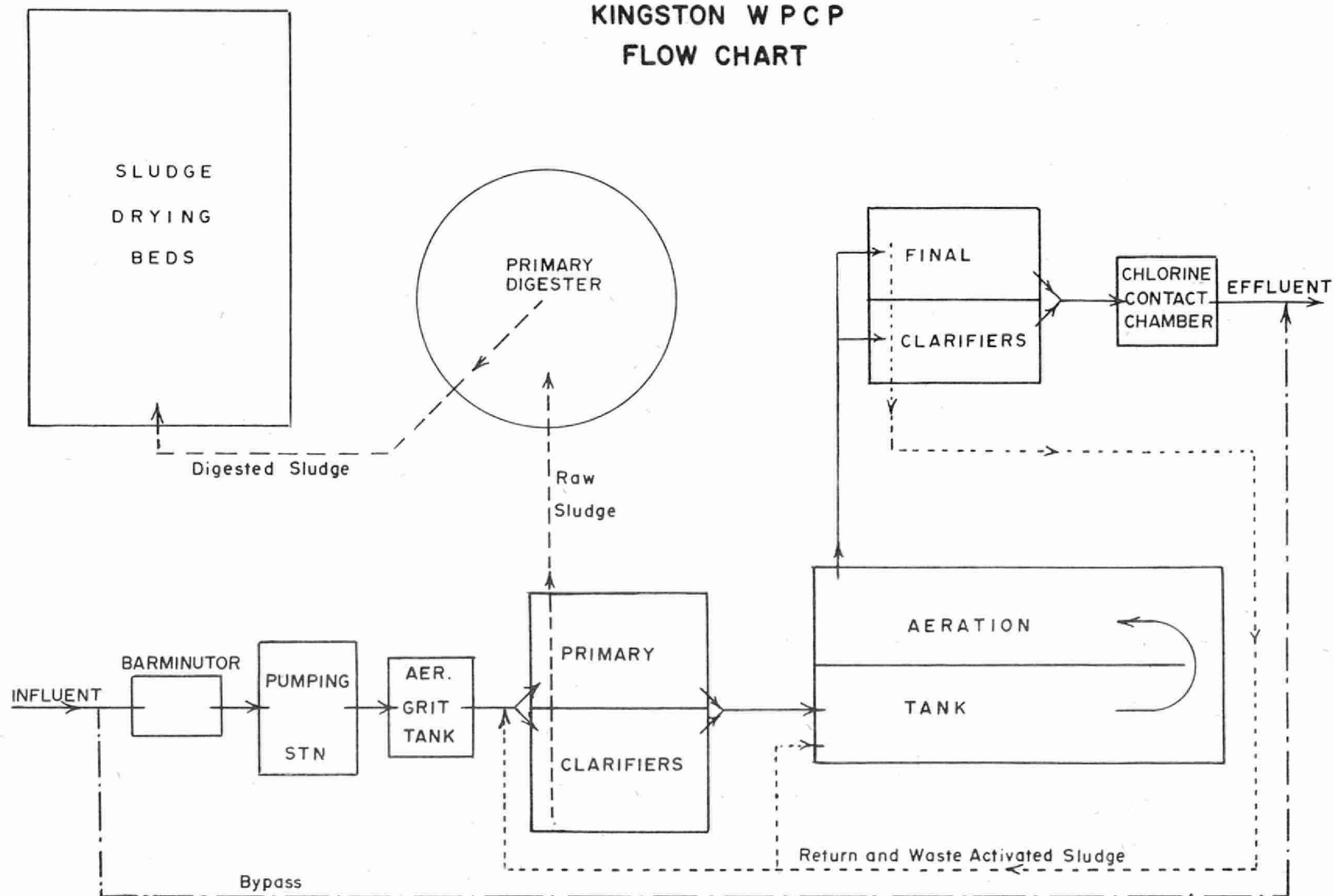
ONTARIO WATER RESOURCES COMMISSION

1971 ANNUAL OPERATING SUMMARY

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# KINGSTON WPCP FLOW CHART



## DESIGN DATA

PROJECT NO. 2-0098-61

TREATMENT Activated Sludge

DESIGN FLOW 0.83 mgd

DESIGN POPULATION 10,000

BOD - Raw Sewage 210 mg/l

SS - - Raw Sewage 250 mg/l

### PRIMARY TREATMENT

#### Comminution

Type: C. P. Barminutor  
Size: One Model C (18")

#### Sewage Lift Pumps

Type: Weinman Type VBM  
Size: Two 1200 gpm @ 35' tdl

#### Grit Removal

Type: Aerated; grit removed by air lift  
Size: 1920 gal  
Retention: 2 min

### Primary Sedimentation

Type: Falk  
Size: Two 46' x 12' x 7'7" deep  
(8,380 cu ft or 52,200 gal)  
Retention: 1.5 hours  
Loading: Surface, 750 gal/ft<sup>2</sup>/day  
Weir, 8,600 gal/ft/day

### SECONDARY TREATMENT

#### Aeration Tanks

Type: Diffused air; Two-pass  
Size: One tank 62' x 22.5' x 15'  
(each pass) (41,900 cu ft  
or 262,000 gal)  
Retention: 7.6 hours

#### Air Supply

Type: Roots-Connersville  
Size: Two 880 scfm

#### Diffusers

Type: C. P. Discfuser  
Space: 63 diffusers per pass  
(wide band)

### Secondary Sedimentation

Type: Falk  
Size: Two 56' x 12' x 9' deep  
(12,100 cu ft or 75,600 gal)  
Retention: 2.2 hours  
Loading: Surface, 562 gal/ft<sup>2</sup>/day  
Weir, 5,050 gal/ft/day

### CHLORINATION

One W & T (100 lb/day)

#### Chlorine Contact Chamber

Size: One 27' 9" x 9' x 8' deep  
(10,300 gal)  
Retention: 18 min

### OUTFALL

3,000 ft to Lake Ontario

### SLUDGE HANDLING

#### Digestion System

Type: Single stage, mixed by sludge recirculation  
Size: One 55' dia x 20' swd  
(54,500 cu ft or 340,000 gal)  
Loading: 0.57 lb/cu ft/mo  
Recirculation pump - one Weinman:  
150 gpm @ 65'

#### Sludge Drying Beds

Four 80' x 20' (6,400 sq ft)



# '71 Review

## GENERAL

This project consists of a 0.83 mgd activated sludge sewage treatment plant with single stage digestion and liquid sludge disposal. Also associated with the treatment plant are five sewage pumping stations.

The capacity of the Airport road pumping station was increased in order to meet with the higher flows that are being received at this pumping station due to new development.

The impellers on the pumps in the Day's Road and Airport Road pumping stations were balanced and a sleeve was installed on one of the pumps in the Day's Road pumping station.

A new bar screen was installed in the wet well of the Day's Road pumping station, to provide more adequate protection of the pumping equipment.

Very high flows in the month of December resulted in an excessive amount of grit being received at the plant which overloaded the sludge removal equipment and caused 6 flights to break.

The sludge haulage contract was terminated by the sludge hauler in the latter part of the year as he was experiencing difficulty in obtaining a sludge disposal site. There was no response to a tender call for a new sludge hauling contract.

The extension to the sewage treatment facilities was being continued.

### EXPENDITURES

The total operating expenditures for the plant and associated pumping stations was \$51,491.27. This was \$1,491.27 over the budget of \$50,000. This over expenditure is primarily due to higher than budgeted for salary increases as a result of CSAO negotiations. The cost of treating 1 million gallons of sewage was \$113.20 or approximately 8 cents per pound of BOD removed.

### PLANT FLOWS and CHLORINATION

A total of 454 million gallons of sewage was treated. The average daily flow of 1.24 mgd exceeded the design capacity of the plant 100 percent of the time. The overload condition is due to increased development of the area and storm water access to the sanitary sewer system. The treatment facilities were severely overloaded in 1971.

Chlorination of the final effluent was practiced from May 13 to October 31. An average chlorine dosage of 3.6 mg/l was required to obtain a 0.5 mg/l chlorine residual after a 15 minute contact period.

### PLANT EFFICIENCY

The average concentrations of BOD and suspended solids in the plant influent were 244 and 254 mg/l respectively.

The average concentrations of BOD and suspended solids in the plant effluent were 89 and 140 mg/l respectively. This represented a reduction in BOD and suspended solids of 64 and 45 percent respectively. These low efficiencies represent the very serious overloading condition at the plant.

These values greatly exceeded the OWRC effluent objectives of 15 mg/l for both BOD and suspended solids.

#### SLUDGE REMOVAL and DIGESTION

A total of 849,000 gallons of raw sludge with an average concentration of 5.8 percent solids was pumped to the digesters. Approximately 587 cubic yards of digested sludge with the solids content of 5.9 percent was disposed of by tank truck. Another 308 cubic yards of digested sludge was applied to the sludge drying beds.

#### CONCLUSIONS

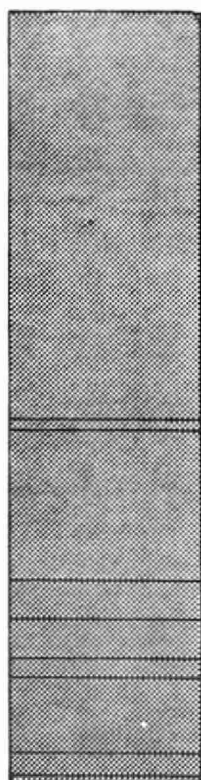
The plant was both hydraulically and organically overloaded in 1971 which resulted in a very poor quality effluent. Every effort should be made to expedite the expansion of the plant and also to reduce the amount of storm water gaining access to the sanitary sewers in order to bring the quality of the effluent within OWRC objectives.

## PROJECT COSTS

NET CAPITAL COST (Final)	\$1,531,682.15
DEDUCT - Portion financed by CMHC/MDLB (Final)	<u>588,503.56</u>
Long Term Debt to OWRC	\$ <u>943,178.59</u>
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1971	\$ <u>100,076.98</u>
Net Operating	\$ 51,491.27
Debt Retirement	17,039.00
Reserve	7,868.30
Interest Charged	<u>52,903.67</u>
TOTAL	\$ <u>129,302.24</u>

### RESERVE ACCOUNT

Balance @ January 1, 1971	\$ 33,500.87
Deposited by Municipality	7,868.30
Interest Earned	<u>2,333.08</u>
	\$ 43,702.25
Less Expenditures	<u>-</u>
Balance @ December 31, 1971	\$ <u>43,702.25</u>



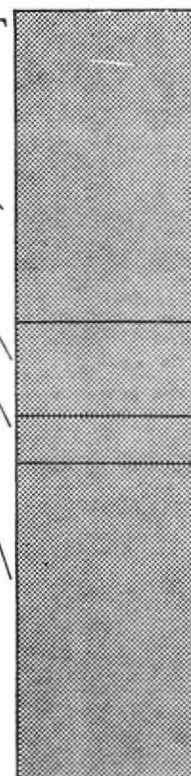
## OPERATING COSTS

● PAYROLL	54 %
● FUEL	1 %
● POWER	20 %
● CHEMICALS	5 %
● GENERAL SUPPLIES	5 %
● EQUIPMENT	2 %
● REPAIRS & MAINTENANCE	10 %
● SUNDRY	3 %
● WATER	NIL %
● TRAVEL	< 1 %

# 1971 COSTS

## TOTAL ANNUAL COST

● NET OPERATING	40 %
● DEBT RETIREMENT	13 %
● RESERVE	6 %
● INTEREST	41 %



## YEARLY OPERATING COSTS

YEAR	SEWAGE TREATED in million gallons	TOTAL OPERATING COSTS	TREATMENT COSTS	
			\$ per million gal	£ per lb BOD
1967	258.570	\$30,775.98	\$119.02	4 cents
1968	314.02	36,455.90	116.09	2 cents
1969	345.0	39,254.02	113.78	3 cents
1970	408.3	44,857.18	109.90	7 cents
1971	454.5	51,491.27	113.30	8 cents

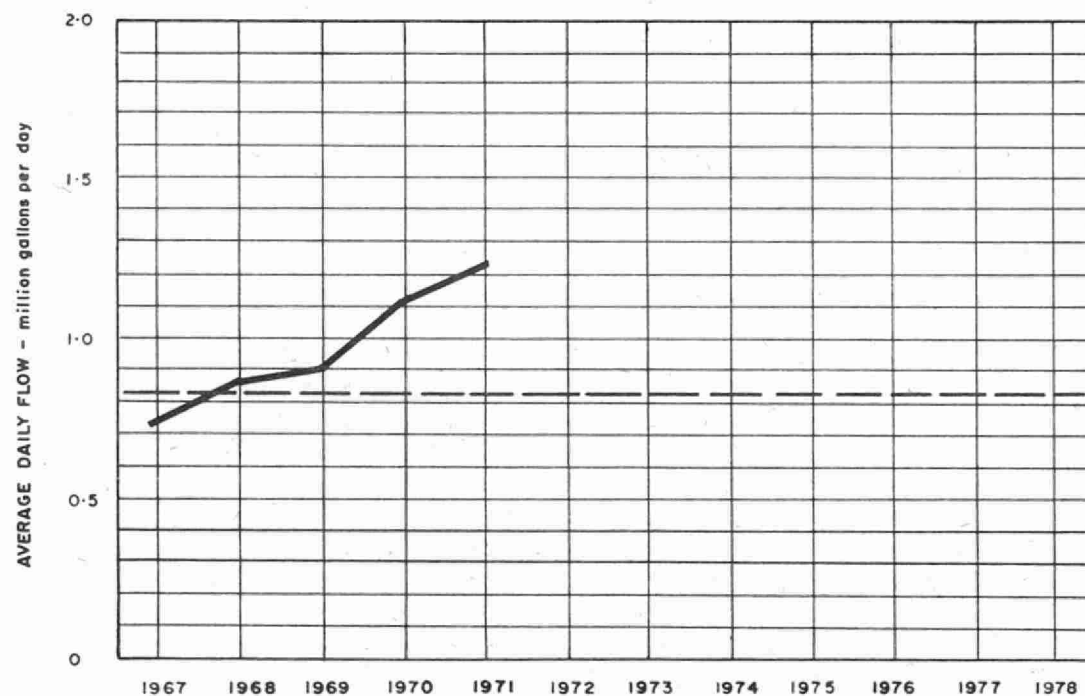
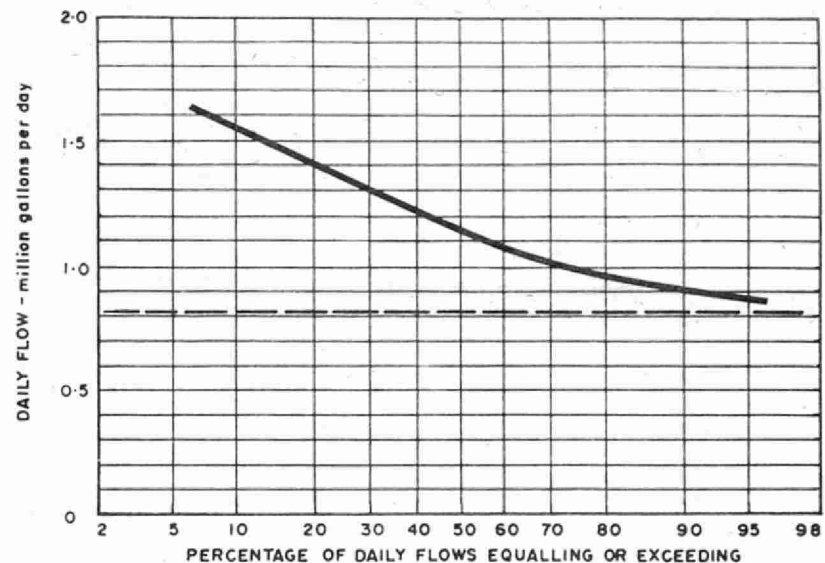
## MONTHLY OPERATING COSTS

MONTH	TOTAL EXPENDITURE	REGULAR PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICALS	GENERAL SUPPLIES	EQUIPMENT	REPAIRS and MAINTENANCE	SUNDRY*	WATER	TRAVEL
JAN	2006.50	1859.15	-	-	-	-	147.35	-	-	-	-	-
FEB	5022.39	2718.56	-	76.20	1690.93	-	194.32	-	195.51	146.87	-	-
MAR	4724.38	1878.45	-	83.21	896.99	-	137.27	-	1638.06	90.40	-	-
APR	4129.35	1851.98	-	82.48	927.23	-	239.38	54.63	834.57	139.08	-	-
MAY	3403.06	1855.59	191.49	-	-	-	229.46	-	996.26	130.26	-	-
JUNE	4374.22	1987.57	24.67	26.33	1841.04	341.10	80.26	-	-	73.25	-	-
JULY	3617.09	1822.58	280.57	-	867.74	341.10	203.07	-	-	102.03	-	-
AUG	3423.17	1866.89	271.67	-	851.63	-	218.53	118.13	60.65	35.67	-	-
SEPT	4785.93	2013.43	136.57	48.90	895.18	295.96	207.24	189.92	-	998.73	-	-
OCT	4263.80	2785.69	-	-	885.59	250.80	209.18	10.00	72.67	49.87	-	-
NOV	4296.84	3008.03	-	-	751.56	17.88	151.83	358.52	14.43	(123.46)	-	118.05
DEC	7444.54	3175.05	-	173.02	952.03	1068.74	367.64	99.13	1505.10	103.83	-	-
TOTAL	51491.27	26822.97	904.97	490.14	10559.92	2315.58	2385.53	830.33	5317.25	1746.53	-	118.05

Brackets indicate credit.

\* Sundry includes sludge haulage costs of \$1,040.80

# PROCESS DATA FLOWS

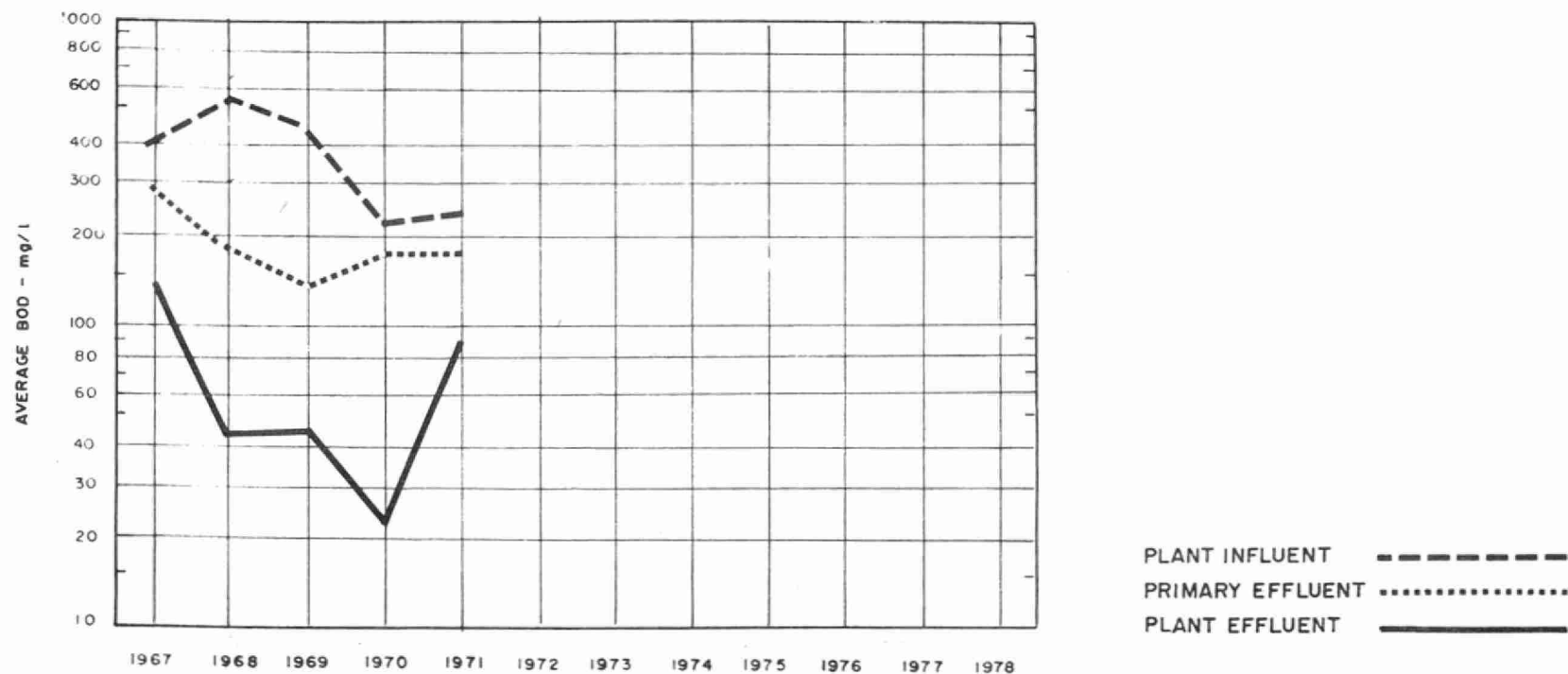
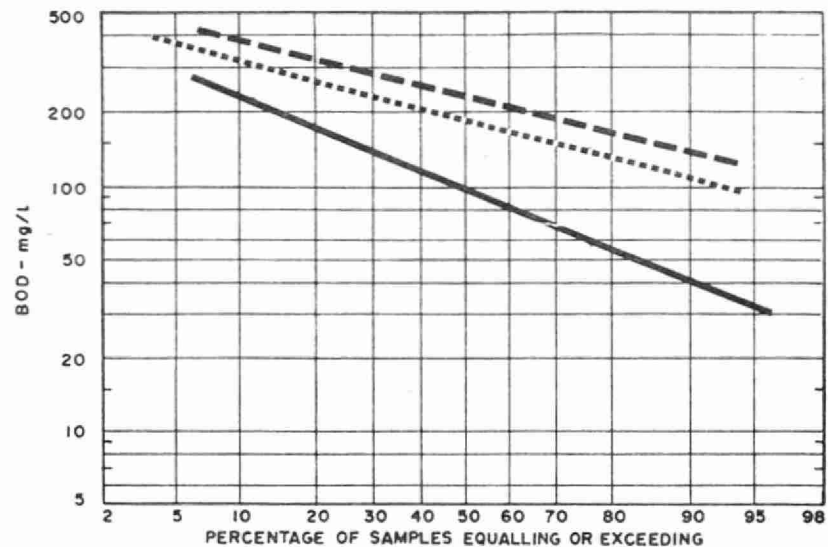


## PLANT PERFORMANCE

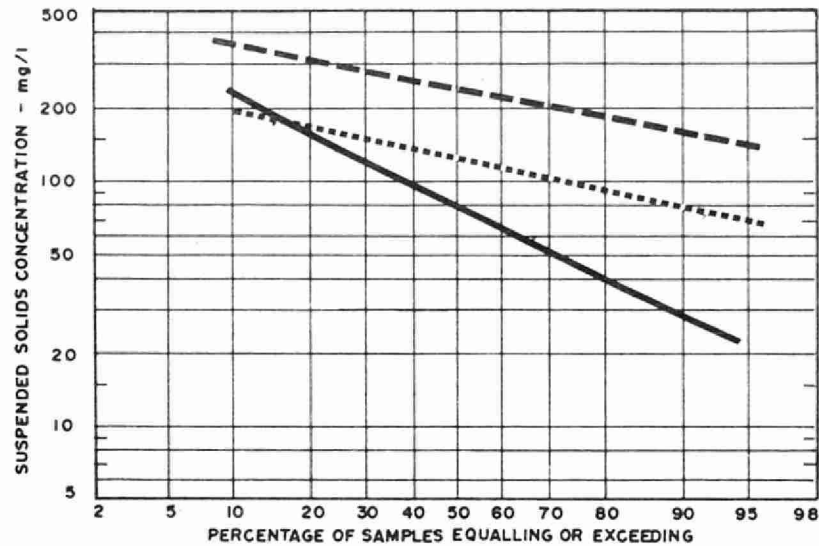
MONTH	FLOWS				BIOCHEMICAL OXYGEN DEMAND				SUSPENDED SOLIDS				TOTAL PHOSPHORUS		
	TOTAL FLOW	AVERAGE DAY	MAXIMUM DAY	MAXIMUM RATE	INFLUENT	EFFLUENT	REDUCTION		INFLUENT	EFFLUENT	REDUCTION		INFLUENT	EFFLUENT	REDUCTION
	million gallons	mil gal	mil gal	mgd	mg/l	mg/l	%	10 <sup>3</sup> pounds	mg/l	mg/l	%	10 <sup>3</sup> pounds	mg/l as P	mg/l as P	%
JAN	32.2	1.04	1.2	1.8	256	91	64	53	151	100	34	16	10.5	5.4	49
FEB	37.0	1.32	2.4	2.0	234	108	54	45	242	150	38	33	9.7	6.5	33
MAR	53.9	1.73	2.4	2.5	128	55	57	39	251	141	44	59	7.9	2.8	65
APR	51.1	1.70	2.4	2.5	133	57	57	39	143	140	2	2	5.3	2.6	51
MAY	36.8	1.19	2.1	2.2	307	70	77	87	242	107	56	20	13.0	7.5	42
JUNE	32.7	1.09	1.3	2.1	266	97	64	55	277	97	65	59	7.3	6.7	8
JULY	31.5	1.00	1.2	1.9	321	73	77	54	434	148	66	90	10.3	6.2	40
AUG	33.0	1.06	2.2	2.5	251	128	49	41	245	393	0	0	7.0	4.3	39
SEPT	33.7	1.12	1.3	2.5	282	100	64	61	207	108	48	33	8.1	8.2	0
OCT	34.8	1.12	1.3	2.2	230	70	70	56	250	83	67	58	-	-	-
NOV	32.9	1.10	1.4	2.2	258	76	71	60	267	60	78	68	9.8	8.0	18
DEC	44.9	1.45	2.1	2.5	200	150	25	13	170	170	0	0	8.7	5.3	39
TOTAL	454.5	-	-	-	-	-	-	603	-	-	-	438	-	-	-
AVG.	-	1.24	MAXIMUM 2.4	MAXIMUM 2.5	244	89	64	50	254	140	45	37	8.9	5.8	35
No. of Samples	-	-	-	-	49	43	-	-	39	36	-	-	14	12	-






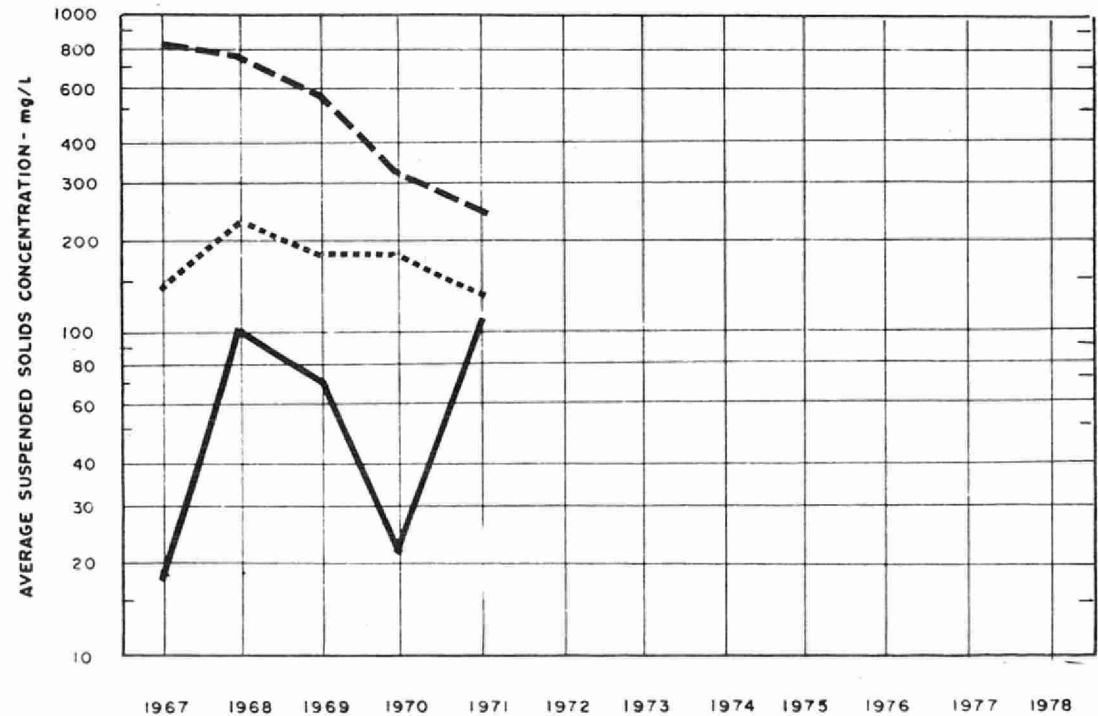
# BIOCHEMICAL OXYGEN DEMAND



# SUSPENDED SOLIDS



PLANT INFLUENT        
 PRIMARY EFFLUENT      
 PLANT EFFLUENT      

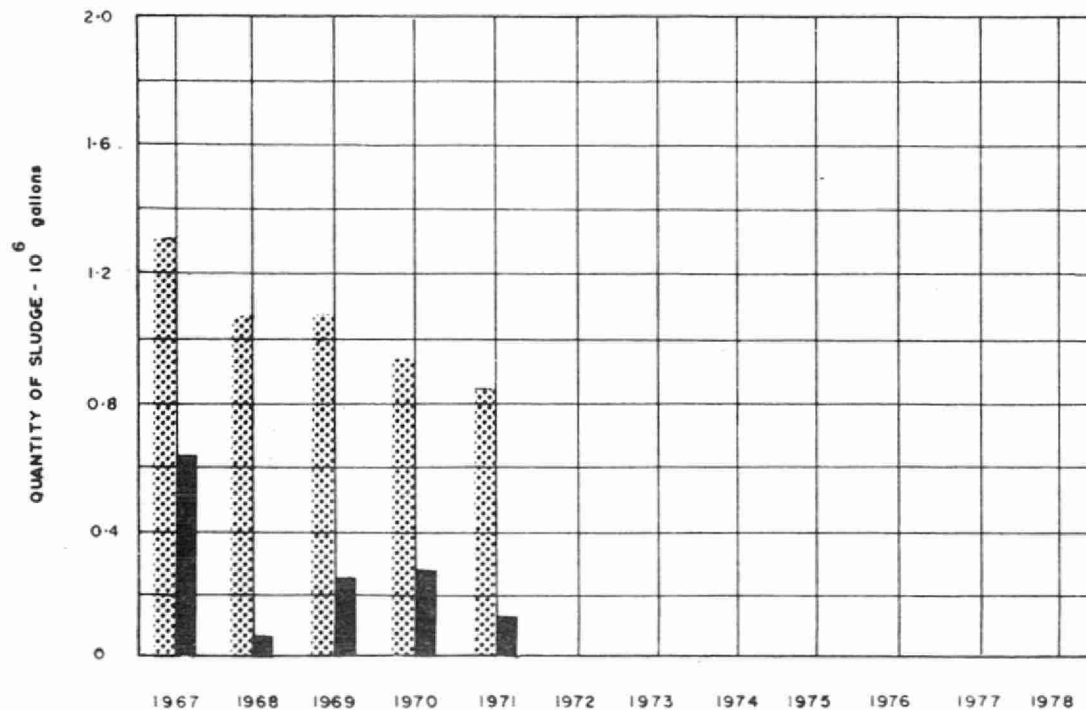
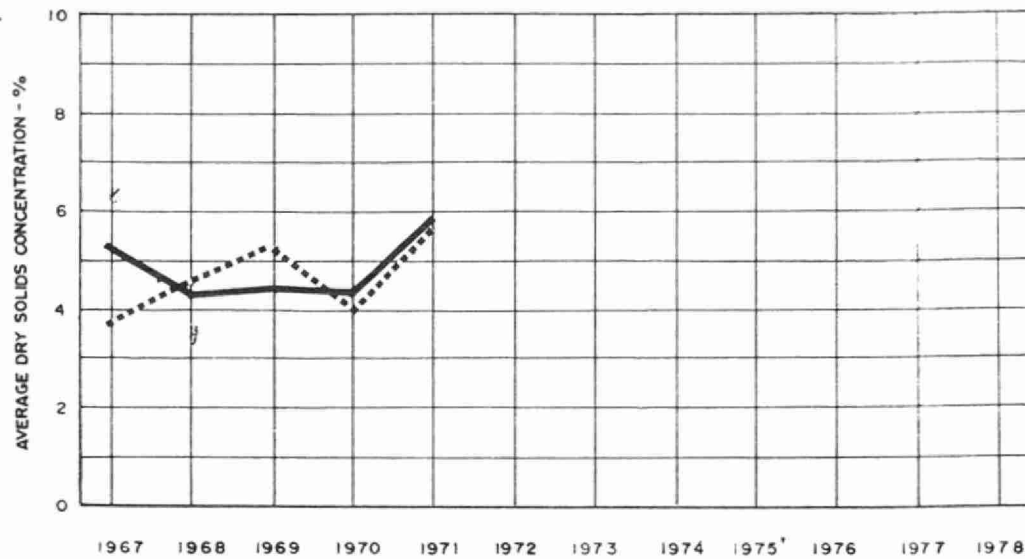


## TREATMENT DATA

MONTH	GRIT	CHLORINATION		PRIMARY EFFLUENT		AERATION			SLUDGE DIGESTION and DISPOSAL							
	QUANTITY REMOVED cubic feet	Cl <sub>2</sub> USED pounds	AVG. DOSE mg/l	BOD mg/l	SUSPENDED SOLIDS mg/l	MLSS CONC mg/l	F/M day <sup>-1</sup>	AIR 1000 ft <sup>3</sup> lb BOD	RAW SLUDGE			DIGESTED SLUDGE			SUPER- NATANT T. S. %	AMOUNT HAULED cubic yards
									QUANTITY 10 <sup>3</sup> gallons	TOTAL SOLIDS %	VOL. SOLIDS %	QUANTITY 10 <sup>3</sup> gallons	TOTAL SOLIDS %	VOL. SOLIDS %		
JAN	0	0	-	192	135	2050	.37	1.6	82	4.4	-	10	-	-	.2	0
FEB	0	0	-	197	132	1680	.52	1.1	72	4.5	77	0	-	-	.5	0
MAR	40	0	-	122	115	2460	.32	1.5	78	5.3	68	10	-	-	.3	0
APR	208	0	-	138	104	2260	.40	1.3	77	6.1	76	10	-	-	.2	0
MAY	300	620	3.2	144	108	2180	.30	2.0	74	4.0	-	10	5.9	-	.3	0
JUNE	20	1160	3.6	220	122	1970	.46	1.3	94	4.3	76	0	6.1	47	.5	0
JULY	15	930	3.0	177	125	1560	.04	1.6	74	-	-	18	4.4	-	-	46
AUG	60	1500	4.5	255	157	1450	.07	1.3	58	-	-	24	-	-	.4	140
SEPT	40	1160	3.5	197	90	1680	.50	7.4	60	7.1	76	28	6.7	-	.4	165
OCT	12	1200	3.4	180	196	1200	.64	1.4	65	-	-	20	-	-	-	118
NOV	24	0	-	168	160	2000	.35	1.7	63	10.3	72	8	-	-	.2	47
DEC	20	0	-	180	150	2080	.48	4.4	52	-	-	12	6.5	53	.3	71
TOTAL	739	6570	-	-	-	-	-	-	849	-	-	150	-	-	-	587
AVG.	1.6 cu. ft/mil gal	1095	3.6	188	127	1880	.37	1.8	71	5.8	74	13	5.9	50	.3	49

# DIGESTION

RAW SLUDGE .....  
DIGESTED SLUDGE ———



RAW SLUDGE TO DIGESTER  
DIGESTED SLUDGE REMOVED

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TD/227/K56/K56/1971/MOE  
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